

FLH Standard Criteria Files

Section 14 –

Special Earthwork Criteria Files

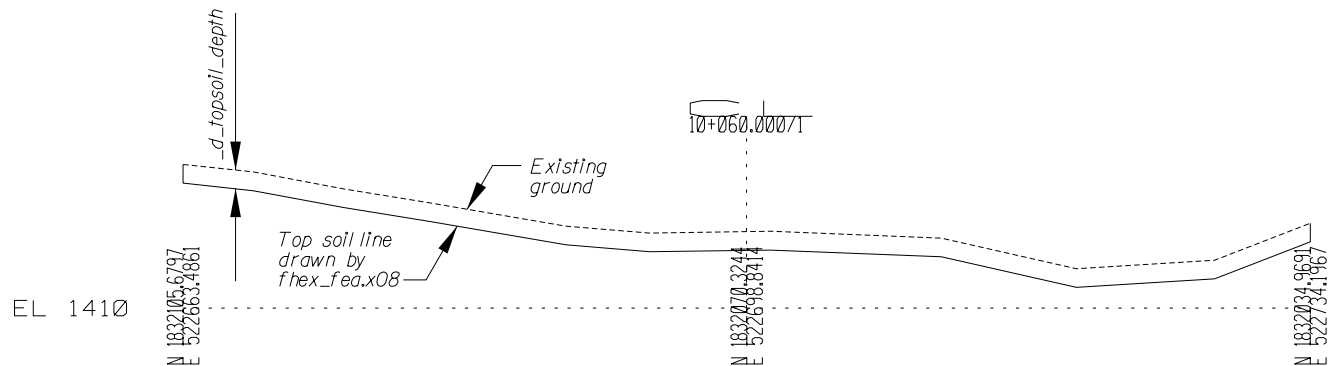
Special Earthwork Criteria Files

Criteria Files	Elements Drawn by Criteria File
fhex_fea.x08	Topsoil, existing pavement, and rock layer limits.
fh_subx2.x08	Subexcavation limits.
fh_x_lim.x08	Excavation limits LT and RT.
c_rkbt1d.x08	Rock buttress plus associated excavation and backfill. Uses lines in plan view dgn file to set station ranges and side of roadway.
c_rkbt1s.x08	Rock buttress plus associated excavation and backfill. Uses exceptions data file to set station ranges and side of roadway.

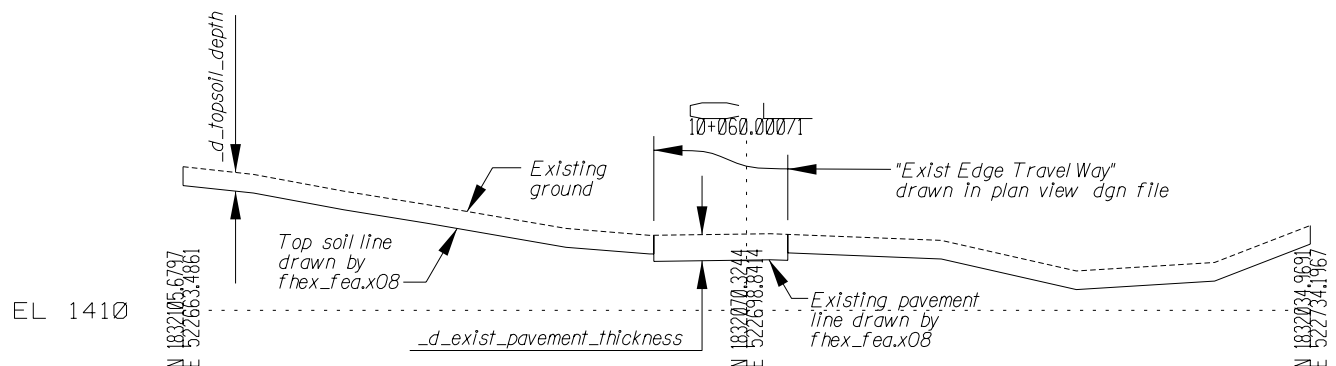
fhex_fea.x08

Draws lines representing the lower limits for topsoil and existing pavement on the proposed cross-sections. These lines are used to by the GEOPAK earthwork procedure to calculate separate quantities for these materials. This criteria file also draws lines representing the upper limit for a rock layer on the proposed cross-sections. These lines are used for two purposes: (1) to allow the slope selection criteria file to draw compound slopes in cross-sections with rock, and (2) to be used the the earthwork procedure to calculate separate quantities for rock excavation.

Example of topsoil only as drawn by fhex_fea.x08



Example of topsoil plus existing pavement as drawn by fhex_fea.x08



define variables that must be assigned values in the input data file:

"maximum existing road width"

define_dgn variables that must be assigned values in the input data file:

"edge existing pavement"

Variables that must be defined in exceptions data file:

_d_exist_pavement_thickness

_d_rock_depth

_d_topsoil_depth

fhex_fea.x08

Notes for fhex_fea.x08:

1. This criteria can be used to draw any combination of these three existing features; you don't have to draw all three. However, even if you're not using it to draw existing pavement you still have to define "maximum existing road width" and "edge existing pavement" in the input file.
2. In the exceptions data file you need to define station ranges only for the variables you are actually using, not for all of them. For example, if you wanted only a 0.15 m topsoil layer drawn, no existing pavement or rock layer, then the exceptions data file would include the following lines:

```
if sta >= 1+000 r 1 and sta <= 2+000 r 1 then
{
  _d_topsoil_depth = 0.15
}
```

No mention of the `_d_exist_pavement_thickness` or `_d_rock_layer` variables would need be included for this example. Also, notice that the information in the exceptions file specifies both the station range(s) and depth(s) for the topsoil, existing pavement, and rock layer, and that this syntax allows for multiple station ranges and depths for these features within a single project.

3. If `fhex_fea.x08` is being used to draw topsoil and/or existing pavement, then it needs to be included only in the side slope lt block in the input file; it has no effect if included in the side slope rt block. If `fhex_fea.x08` is being used to draw rock layer(s), then it needs to be included in both the side slope lt and side slope rt blocks in the input file.
4. When `fhex_fea.x08` is used to draw rock layer(s), it must be used in a separate "preprocessing" run to draw these existing features onto the cross-sections prior to running the criteria files to draw the proposed roadway features. This is because the slope selection criteria can't find any elements drawn during the current run, and therefore the compound slope in rock layers feature in the slope selection criteria won't work. When `fhex_fea.x08` is used to draw topsoil and/or existing pavement only, it can be included in the same run as all the other criteria files, or it can be used in a separate preprocessing run.
5. The include sequence for `fhex_fea.x08` should always be somewhere after the slope selection criteria file.
6. In order to get topsoil quantities with the GEOPAK earthwork procedure, use this criteria file (to draw the bottom of the topsoil layer) plus the excavation limit criteria file `fh_x_lim.x08` (to draw the limits left and right of the topsoil removal).
7. An alternate way to draw the topsoil layer (if it is a constant depth for the entire project) is to make a selection set of the existing ground lines in the cross-section file, copy the selection set downward by the topsoil depth, and changing the level/symbology to something different than the existing ground level/symbology.
8. See the Compound Cut Slopes in Rock section of the Slope Selection page to see an example of how a rock layer draw with this criteria is used.
9. When drawing topsoil plus existing road, the criteria will always write an error message similar

to the following into the log file for every cross-section:

Station = 2+000.00, Region = 1

*WARNING: NO INTERSECTION FOUND while attempting
to DRAW TO DEFINE_DGN " EDGE EXISTING PAVEMENT "
from coordinate 159305.5544 558377.2863*

*moving toward coordinate 159347.3170 558354.9270
at line: 247*

This problem has been detected on the LEFT side of cluster with:

baseline = CL,

profile = CL,

tie = 0.000000,

pgl chain = ,

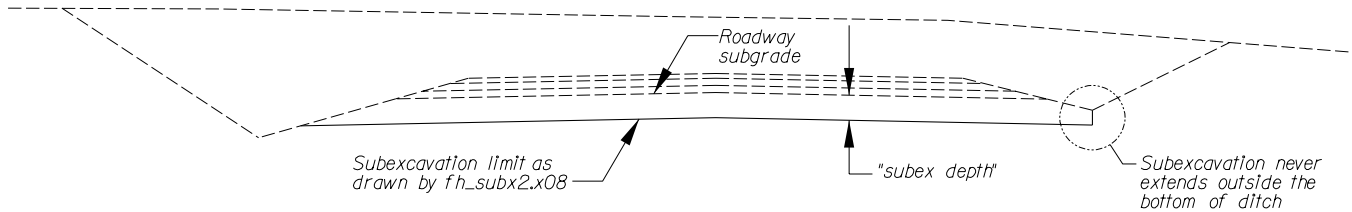
cluster offset = ,

This error message should be ignored; it has no effect on the accuracy of the topsoil and existing road lines drawn by the criteria file.

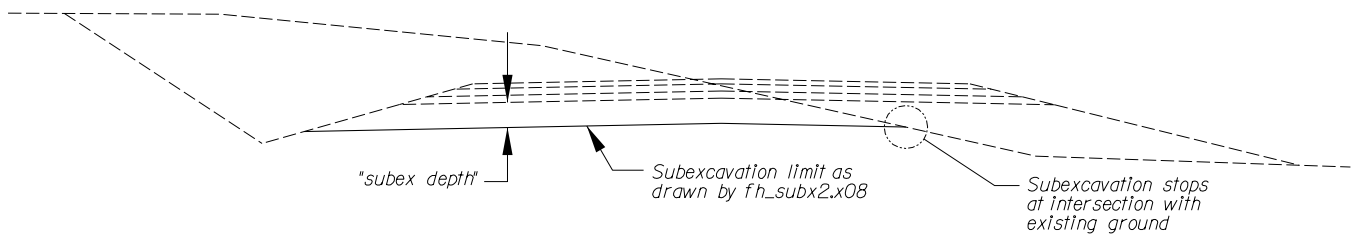
fh_subx2.x08

Draws the bottom of a subexcavation layer.

Example of subexcavation for cut only cross-section.



Example of subexcavation for cut/fill cross-section.



define variables that must be assigned values in the input data file:

"subex depth"

define_dgn variables that must be assigned values in the input data file:

None

Variables that must be defined in exceptions data file:

None

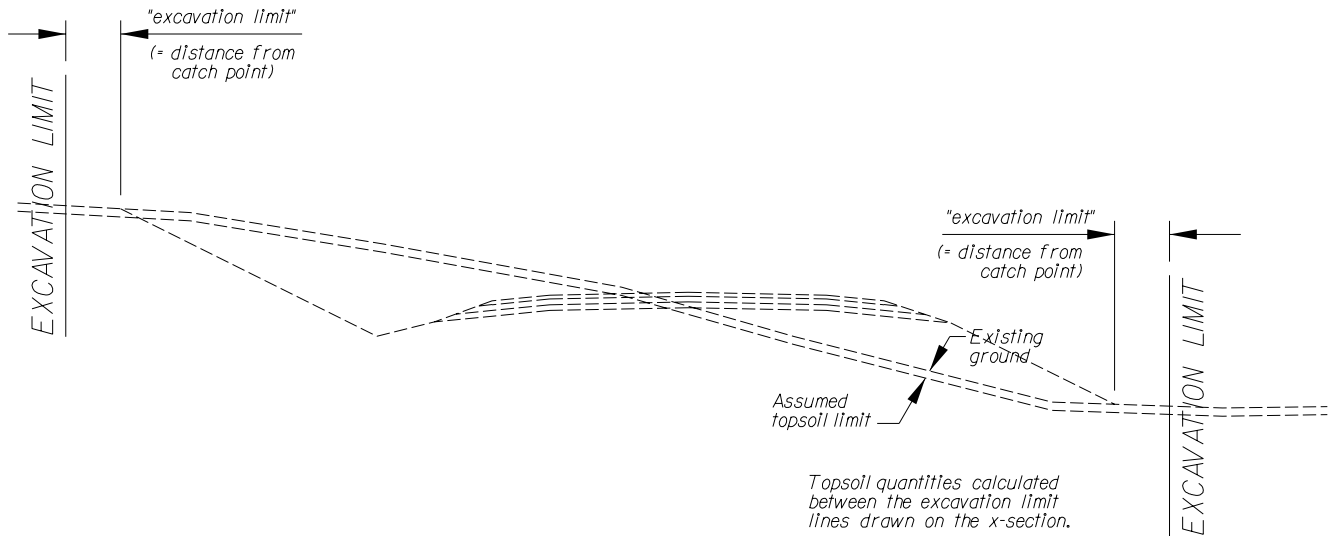
Notes for fh_subx2.x08:

1. Include sequence for fh_subx2.x08 must be somewhere after the slope selection criteria (fh_ss3.x08 or fh_ss_uc.x08).
2. If fh_subx2.x08 is used, it must be included in both the side slope lt and the side slope rt sections in order for it to work correctly.
3. Generally, the subgrade line will mirror the top of pavement slope. However, if the top of pavement has any breaks in slope (such as what's drawn by fh_wide.x08 or fh_sh[1-4].x08), the subexcavation will be drawn parallel to a line from the top of pavement at centerline to the outermost top of pavement point).
4. Currently there is no method built into fh_subx2.x08 to switch subexcavation on and off for station ranges within a project by using the exceptions data file.

5. This criteria is set up to do a maximum of two subexcavation line segments per side (in situations where the existing ground is undulating above and below the theoretical subex line).

fh_x_lim.x08

Draws and labels a vertical line on the cross-section representing the excavation limits. This line may be required to get some earthwork quantities such as topsoil or subexcavation.



define variables that must be assigned values in the input data file:

"excavation limit"

define_dgn variables that must be assigned values in the input data file:

None

Variables that must be defined in exceptions data file:

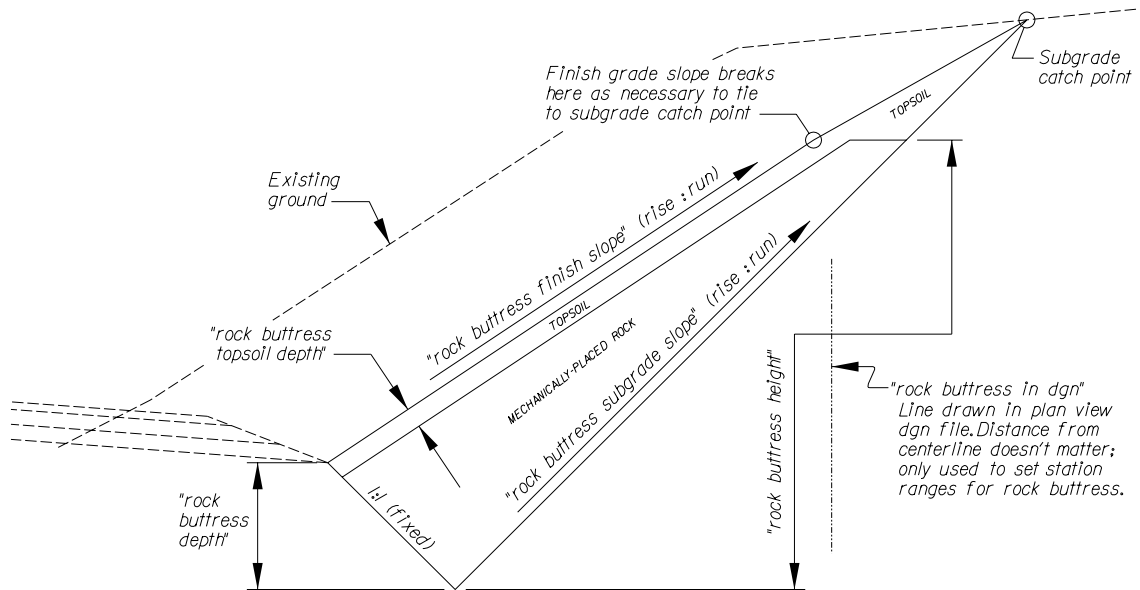
None

Notes for fh_x_lim.x08:

1. Excavation limits are only required if quantities for topsoil and/or subexcavation are going to be calculated from the cross-sections.
2. The value of the define variable "excavation limit" is the distance from the cut/fill catch point to where the line is drawn. In almost all cases "excavation limit" should be set to 0 in the input file (i.e., excavation limits coincide with the cut/fill catch point).
3. The only thing this criteria does is draw a vertical line on lv=9 and co=22, and labels it.

c_rkbt1d.x08

Draws a rock buttress plus associated special excavation and backfill. Station ranges and side of the roadway are set using line(s) drawn in a plan view dgn file.
(Contrast this with c_rkbt1s.x08, where the station ranges and side of the roadway for the rock buttress are set in the exceptions data file.)



define variables that must be assigned values in the input data file:

- "rock buttress finish slope" (rise:run, e.g., 1:1.5)
- "rock buttress subgrade slope" (rise:run value, e.g., 1:1.5)
- "rock buttress depth"
- "rock buttress height"
- "rock buttress topsoil depth"

define_dgn variables that must be assigned values in the input data file:

- "rock buttress in dgn"

Variables that must be defined in exceptions data file:

none

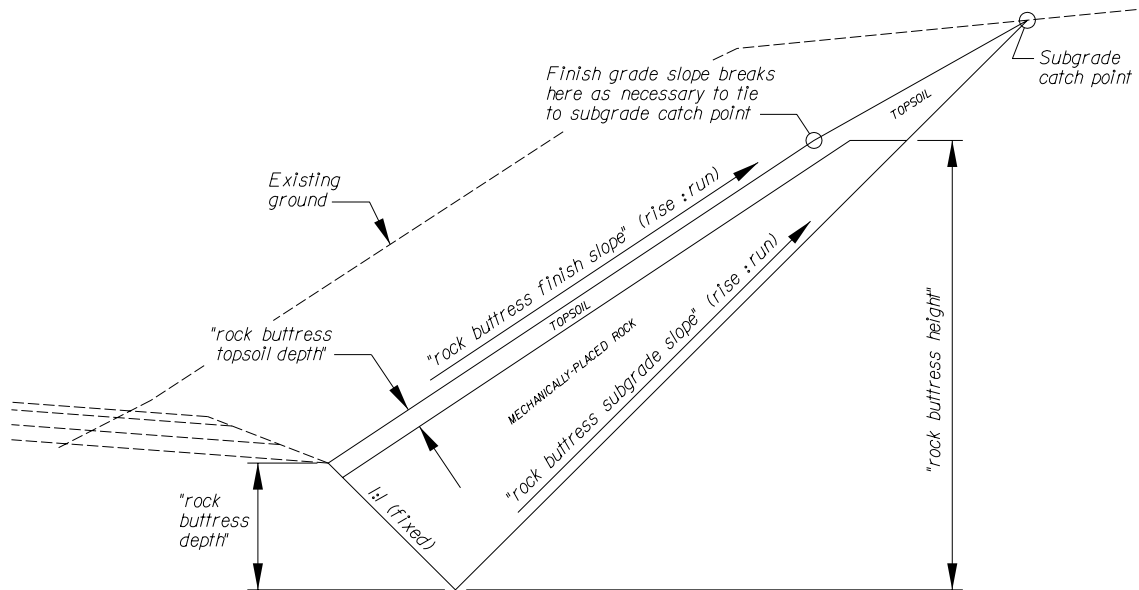
Notes for c_rkbt1d.x08:

- Both station ranges and side of roadway for the rock buttress are set using lines drawn in plan view dgn file (define_dgn variable "rock buttress in dgn"). The distance the line is drawn from centerline is irrelevant -- the in dgn line is only used to toggle on drawing the rock buttress.
- A hidden define variable ("~line in dgn search dist") is used to limit the search distance from centerline for the "rock buttress in dgn" line. By default the search distance is set to 25.

3. The method of setting the station ranges for the rock buttress is the only difference between this criteria file and c_rkbt1s.x08.
4. If the roadway subgrade shoulder is below existing ground but the ground configuration won't allow a full height rock buttress, then a modified version of the buttress (see Misc. Details section below) will be drawn.
5. If the roadway subgrade shoulder is above existing ground, then nothing further will be drawn by this or any subsequent criteria (other than an error message).
6. Both "rock buttress finish slope" and "rock buttress subgrade slope" should be defined as RISE:RUN values using the standard GEOPAK slope sign convention. Therefore these variables should be assigned values like 1:1.5 (not -1:1.5 -- the slopes are up and away from centerline).
7. The level/symbology used by this criteria to draw the rock buttress (together with some "doubled" lines) will allow the user to get both slope stake books and special earthwork quantities for the buttress. However, in order to accomplish this a few minor changes must be made to the "standard" setups as follows:
In the earthwork input file:
 - For the Existing Ground Line classification set the fill multiplication factor to 0.000001. (Set the excavation multiplication factors to 0.90 or whatever Materials has recommended.)
 - Add a Proposed Undercut with soil type BUTTRESS_ROCK and lv=47 co=47. Set all the excavation and fill multiplication factors to 0.000001.
 - Add a Proposed Undercut with soil type BUTTRESS_TOPSOIL and lv=48 co=48. Set all the excavation and fill multiplication factors to 0.000001.
 - Add a Proposed Undercut with the exact same soil type as was associated with Existing Ground. (Typically this would be soil type ROADWAY_EXC.) Set all the excavation and fill multiplication factors to 0.000001.In the slope stake report dialog:
 - Do not include lv=47,48,49 co=47,48,49 in the Proposed Finish Grade level/symbology.
8. The initial cut slope from the roadway shoulder down to the invert of the underdrain at the bottom of the buttress is a fixed 1:1 slope -- the user cannot adjust this.
9. This criteria is a slightly modified version of the rock buttress criteria originally written for the Sequoia National Park project.

c_rkbt1s.x08

Draws a rock buttress plus associated special excavation and backfill. Station ranges and side of the roadway where the rock buttress is drawn are set in the exceptions data file.
(Contrast this with *c_rkbt1d.x08*, where the station ranges and side of the roadway for the rock buttress are set using lines drawn in a plan view dgn file.)



define variables that must be assigned values in the input data file:

"rock buttress finish slope" (rise:run, e.g., 1:1.5)
 "rock buttress subgrade slope" (rise:run value, e.g., 1:1.5)
 "rock buttress depth"
 "rock buttress height"
 "rock buttress topsoil depth"

define_dgn variables that must be assigned values in the input data file:

None

Variables that must be defined in exceptions data file:

_d_draw_rock_buttress_lt
 _d_draw_rock_buttress_rt

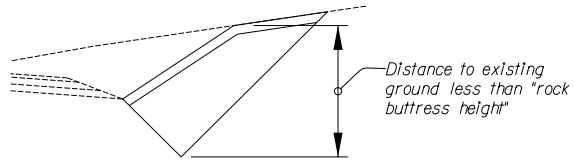
Notes for c_rkbt1s.x08:

- Both station ranges and side of roadway for the rock buttress are set by assigning the _d_draw_rock_buttress_[lt,rt] variables a value of 1 in the exceptions data file using the following syntax:

```
if sta >= 1+000 r 1 and sta <= 2+000 r 1 then
{
  _d_draw_rock_buttress_lt = 1
}
```

2. The method of setting the station ranges for the rock buttress is the only difference between this criteria file and c_rkbt1d.x08.
3. If the roadway subgrade shoulder is below existing ground but the ground configuration won't allow a full height rock buttress, then a modified version of the buttress (see Misc. Details section below) will be drawn.
4. If the roadway subgrade shoulder is above existing ground, then nothing further will be drawn by this or any subsequent criteria (other than an error message).
5. Both "rock buttress finish slope" and "rock buttress subgrade slope" should be defined as RISE:RUN values using the standard GEOPAK slope sign convention. Therefore these variables should be assigned values like 1:1.5 (not -1:1.5 -- the slopes are up and away from centerline).
6. The level/symbology used by this criteria to draw the rock buttress (together with some "doubled" lines) will allow the user to get both slope stake books and special earthwork quantities for the buttress. However, in order to accomplish this a few minor changes must be made to the "standard" setups as follows:
In the earthwork input file:
 - For the Existing Ground Line classification set the fill multiplication factor to 0.000001. (Set the excavation multiplication factors to 0.90 or whatever Materials has recommended.)
 - Add a Proposed Undercut with soil type BUTTRESS_ROCK and lv=47 co=47. Set all the excavation and fill multiplication factors to 0.000001.
 - Add a Proposed Undercut with soil type BUTTRESS_TOPSOIL and lv=48 co=48. Set all the excavation and fill multiplication factors to 0.000001.
 - Add a Proposed Undercut with the exact same soil type as was associated with Existing Ground. (Typically this would be soil type ROADWAY_EXC.) Set all the excavation and fill multiplication factors to 0.000001.In the slope stake report dialog:
 - Do not include lv=47,48,49 co=47,48,49 in the Proposed Finish Grade level/symbology.
7. The initial cut slope from the roadway shoulder down to the invert of the underdrain at the bottom of the buttress is a fixed 1:1 slope -- the user cannot adjust this.
8. This criteria is a slightly modified version of the rock buttress criteria originally written for the Sequoia National Park project.

Rock Buttress Details



ROCK BUTTRESS SPECIAL CASE
(Used where existing ground
doesn't allow full buttress height)